TRP-4A RADIO SET

OKI electric industry company, limited

TOKYO JAPAN

TRP-4A RADIO SET

With the TRP-4A, you have a radio station exclusively yours at all times, a station engineered and designed to provide EXCEPTIONAL performance quality that is sure to last for years and years.

The TRP-4A has been improved from the TRP-4 developed in 1961 as the world's first manpack radio set to operate on the SSB transmission principle. Since its debut on the market, the TRP-4 has found SENSATIONAL acceptance throughout the world as the best conceivable manpack set. Unceasing pursuit of the ultimate in manpack set design, has been continued, resulting in the TRP-4A, built by expert Oki engineers for the most exacting needs.

Everything that is required for it to operate as a radio station is incorporated, and can be accommodated in a haversack. One man can carry it to anywhere desired.

Wherever it goes, the TRP-4A gives optimum performance, even in the tropical jungle which has so far provided the worst barrier to portable radio sets.

Even during adverse weather conditions, for example, in tropical cloudbursts, or under heavy snowfalls in a cold district, the TRP-4A assures you of outstanding reliability and performance with its water proof construction.

The TRP-4A covers any range of communication with the six preset channels and the attached rod and dipole antennas. Through the use of the dipole antenna, the TRP-4A can readily span a distance of 300 kilometers in radio telephone. A still longer distance can be reached, depending on the CW facilities.

The TRP-4A can operate under any power supply conditions. The build-in rechargeable nickel cadmium cells, packed leak-proof, can withstand any severe environments. The dry cells are also available on order. Even when the cells run out in the field, the specially designed hand generator allows continuous communications.

Through the use of the Oki transistors and components, noted for their top quality and long life, the TRP-4A is precision-engineered to bring you this assurance of dependability..
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CHECK THESE FEATURES !

(1) Communication system and frequency used in TRP-4A

(a) Advantages of SSB System:

The TRP-4A is a manpack radio set for which SSB system has been adopted, due to the following reason.

Compared with conventional DSB system,

SSB system
* Requires less transmitting power,
* Decreased receiving noise,
* Reduces fading interference,
* Gives you greater privacy, etc.

In view of the above advantages, SSB system radio set is eight times more effective in power gain over DSB system equipment, i.e. it requires only one eighth of the power needed to transmit DSB signal.

(b) HF Band used in TRP-4A:

OKI employed HF band in the TRP-4A although most of conventional manpack radio transmitter-receivers use VHF band.

In short distance communication is mostly used a ground wave which attenuates in proportion to the square of frequency. Therefore, the adoption of HF band provides you with a communication of much longer range than that of VHF band. In addition, HF band permits a middle and long distance communications by utilizing ionospheric reflection while VHF band, running through ionosphere, does not allow it.

(2) Six pre-set channels

The TRP-4A provides six specified channels between 2.5 and 7.8 Mc. These channels can be switched from one to another by the channel selector on the front panel. The six pre-set channels always assure you of satisfactory communications over long or short distances, day or night.

(3) Easy adjustment

In the case of the dipole antenna, the length of the antenna can be adjusted with ease by operating the plug and jack of the elements. The rod antenna, on the other hand, should be adjusted to the best condition by rotating the ANT TUNE knob of the front panel. The condition of the rod antenna can be checked with the meter of the front panel, because test radio waves are automatically transmitted by the rotation of the "SYSTEM" switch to the "ANT TUNE" position. In the case of the inclined antenna, a long wire (with a series capacitor), approximately 10m in total length, should be connected to the "ROD ANT" terminal and should be adjusted to the optimum position by means of the "ANT TUNE" knob and meter of the front panel.

(4) Transistorized circuitry

The TRP-4A SSB transceiver consists of all-transistorized and printed circuits which make for standardized quality and high stability. Smaller in size and lighter in weight, it consumes far less current than other makes. The transistors used in each circuit are quality silicon epitaxial planer type transistors, making the best use of Oki semiconductor technology. The TRP-4A, therefore, affords strong resistance to high temperatures. Furthermore, the use of the same type of transistors in each circuit facilitates resupply and servicing.

The TRP-4A incorporates only four types of transistors. Of the 22 transistors in total, 18 are of the same type.

(5) Compatibility with DSB radio set

For communications with the conventional DSB radio set, the TRP-4A can transmit SSB with carrier. At the same time, the intermediate frequency amplifier circuit, which contains a filter for exclusive use with DSB, ensures quality reception. Type of emission can be switched with ease by operating the "SYSTEM" switch of the front panel.

(6) Heat Resistance

Because of the use of the silicon transistors as described in paragraph (4), the TRP-4A offers strong resistance to ambient temperatures. To make assurance doubly sure, the carrying bag of the TRP-4A is made of

canvas containing adiabatic materials. As a result, the set assures trouble-free operation even when exposed to the intense direct sun, in tropical areas. At low temperatures as well, it provides you with dependable operation. At the same time, the bag serves as a buffer against shock.

(7) Tropical treatment

The TRP-4A is given chemical anti-humidity, anti-mold and anti-insect treatment to ensure trouble-free operation in high-temperature and high-humidity tropical areas.

(8) Rechargeable long-life batteries

The power supply for the TRP-4A consists of nickel-cadmium-alkali batteries which are leak-proof in any position. A charger is available on order. Powered by these batteries, the TRP-4A allows approximately 20 hours of continuous operation at the operational ratio of "1" for transmission to "9" for reception. With proper maintenance, the batteries can go through several hundred cycles.

The set can also be operated from a 6V external DC power source or from ordinary dry cells.

(9) Variety of accessories

In addition to the standard accessories, a variety of accessories is available to meet your particular requirements.

EXCLUSIVE TRP-4A FRONT PANEL

(1) Stout Die-cast Front Panel

The aluminum die-cast front panel features rugged construction. The three projections on the surface protect the controls when the set is placed panel-side down for internal checks.

(2) Only Four Easy-to-Adjust Controls and Switches

"SYSTEM"	Switches power supply ON and OFF and type of emissions.
"VOLUME"	Controls receiver gain.
"CHANNEL"	Switches to any of six pre-set channels instantly.
"ANT TUNE"	Tunes rod antenna.

(3) Meter for Operational Convenience

The meter enables you to check the battery voltage and antenna current for convenient antenna tuning.

(4) Water-proof Construction

The Front Panel is designed and built to be water-proof, allowing you to use the set even under heavy rainfalls.

(5) Two Handset Connectors

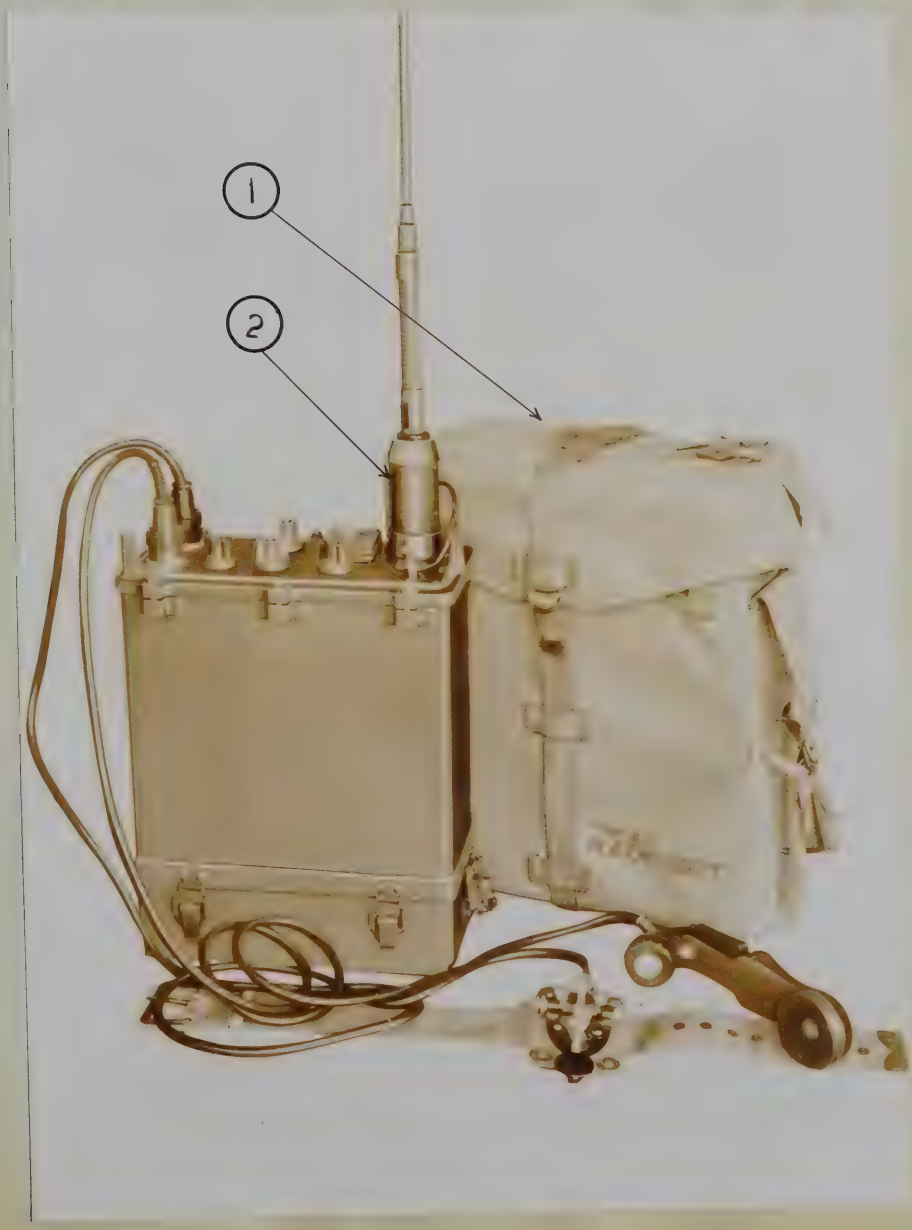
The connectors can be used both for the handset and Morse key. When the Morse key is not used, a monitoring handset can be connected in addition to the communicating handset.

① CARRYING BAG

Many years of experience, as well as ideas based on the opinions of many users, are embodied in this carrying bag. It is simplicity itself to use. To protect the set from heat generated by the strong, direct sun in tropical areas, the bag contains adiabatic materials. On both sides of the bag pockets are provided to accommodate the rod antenna and the handset. The bag enables you to carry the TRP-4A as a perfect one-man pack set.

② ROD ANTENNA BASE OF SPECIAL DESIGN

The base of the rod antenna is of coaxial construction with the external circumference connected to the case. This eliminates the possibility of insulation drop in the antenna during rainfall, giving optimum communications in all conditions at all times.



① PRINTED SHEET NO. 2

② CHASSIS FOR EASY MAINTENANCE AND CHECKOUT

The RF circuit controls can be adjusted on one plane.

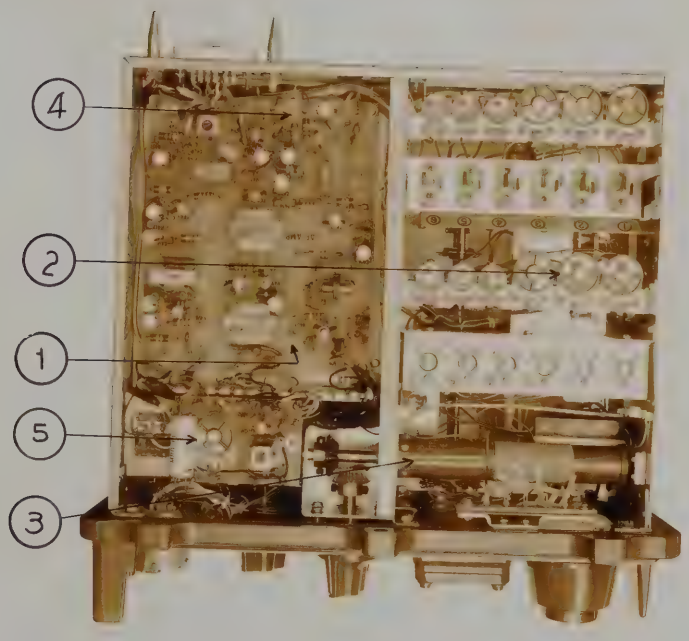
③ HIGH-PERFORMANCE LOADING COIL

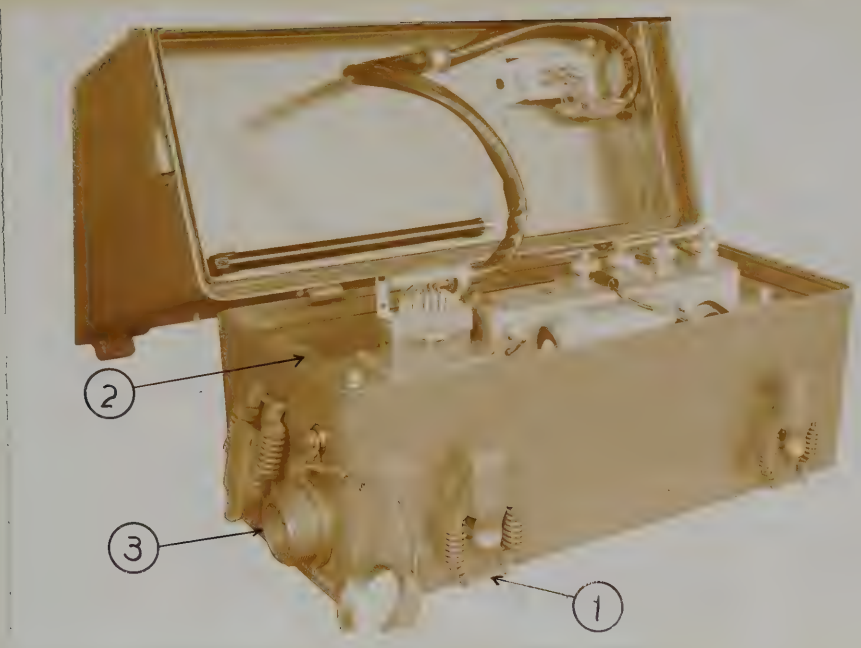
Since the loading coil affects the efficiency of communications by the rod antenna, a coil noted for high Q and low loss is used.

④ PRINTED CIRCUITS

All circuits other than the channel selector circuit are printed, which helps standardize quality and reduce trouble to a minimum.

⑤ DSB RECEIVER UNIT





① POWER SUPPLY EASY TO MOUNT AND REMOVE

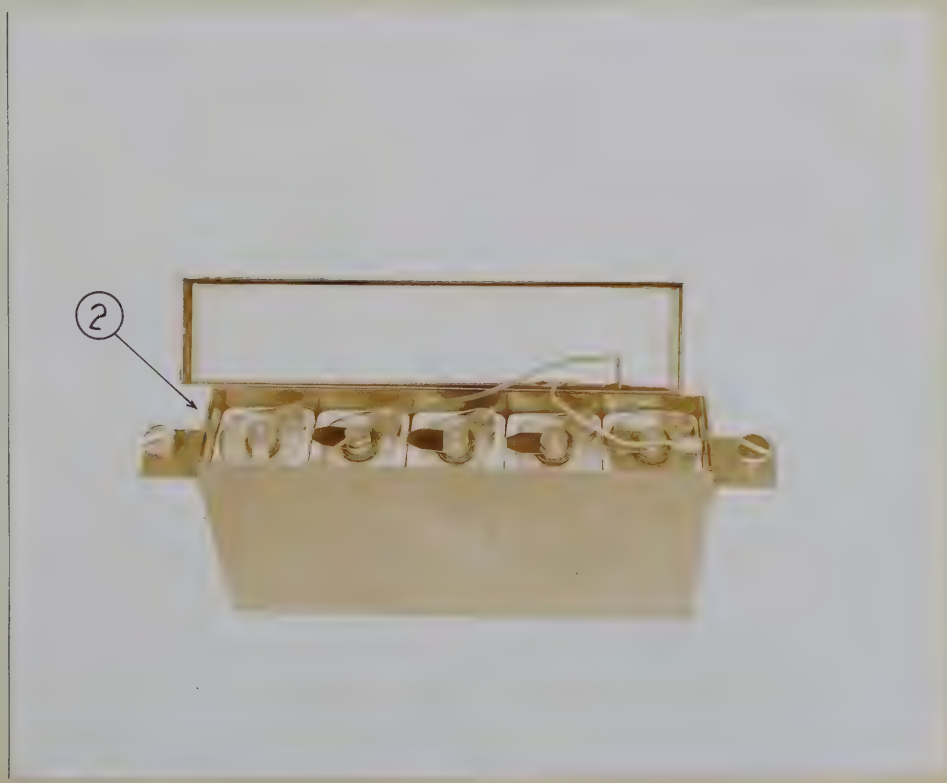
The power supply is easily detached from the transceiver proper by unfastening the six catch clips.

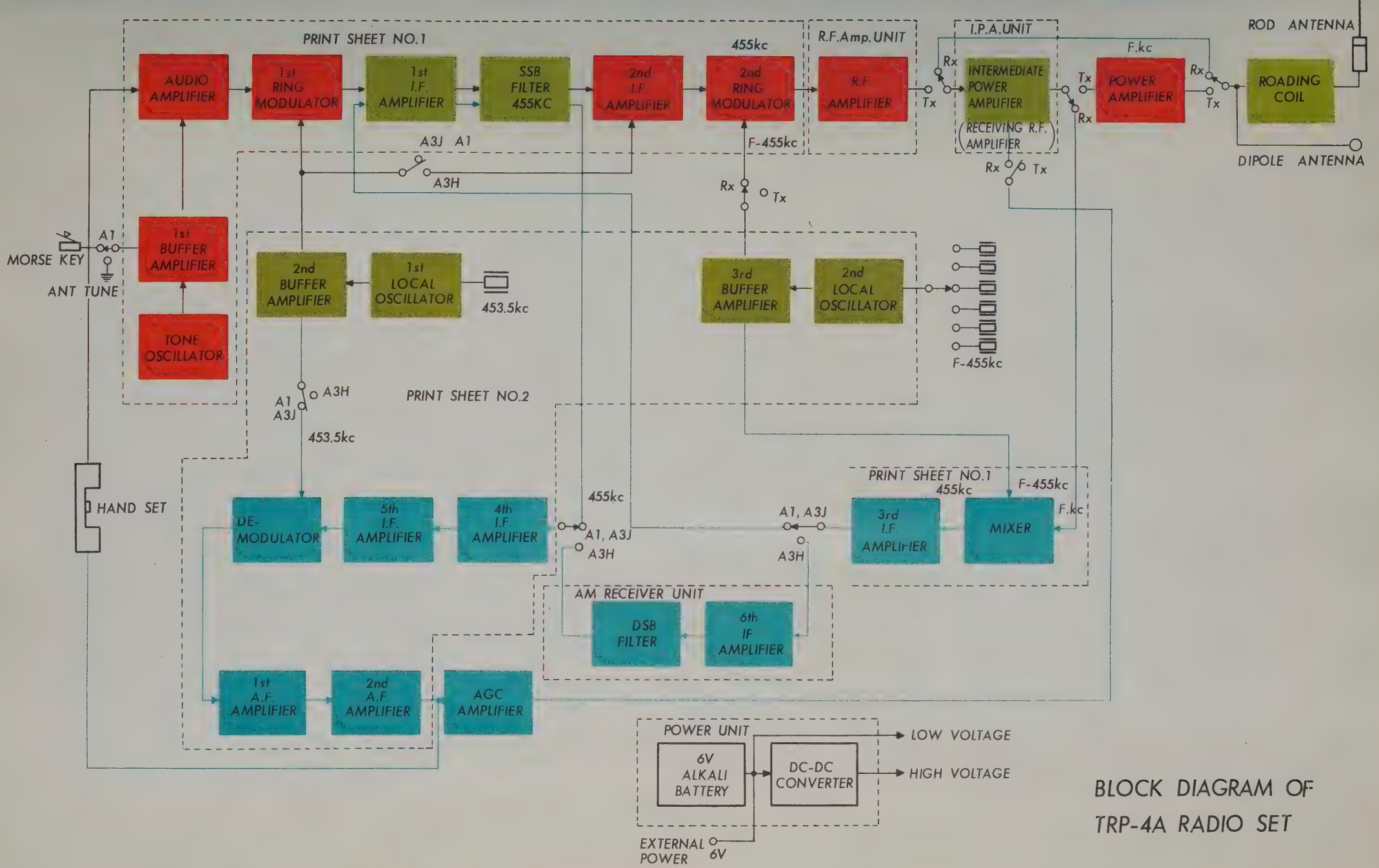
② TOP PERFORMANCE NICKEL CADMIUM ALKALI BATTERY

The battery entirely eliminates the possibility of leakage. Once charged, it can operate the TRP-4A for 20 hours.

③ OPERABLE FROM EXTERNAL POWER SOURCE

An external power source connector is provided which allows connection to a 6V external battery or to the hand generator as the occasion may demand.





BLOCK DIAGRAM OF TRP-4A RADIO SET

CIRCUIT OPERATION

The drawing at left is an overall schematic diagram showing the signal path of the TRP-4A manpack SSB radio set. In the drawing, the system shown in red shows the transmission system, the system in green the common transmission and reception system, and the system in blue the reception system.

Except for the transmitting power amplifier, the set is divided into five units, all the circuits of which are integrated on the printed sheets.

No. 1 printed sheet is mounted on the rear of the chassis and accommodates the tone oscillator, 1st buffer amplifier, audio amplifier, 1st and 2nd ring modulators 1st and 2nd IF amplifiers, SSB filter, and mixer and 3rd IF amplifier of the receiver.

No. 2 arranged on the top of the chassis, accommodates the 1st and 2nd local oscillators, and 2nd and 3rd buffer amplifiers, and the receiving circuit i.e., 4th and 5th IF amplifiers, demodulator, and AF amplifier circuits.

In addition there are printed sheets for the transmitting RF amplifier unit, IPA (Receiving RF Amplifier) unit, and DSB receiving unit. The power unit is accommodated in a separate case together with the 6V alkali bettery. In the drawing, the TX-RX switching section indicates that transmission and reception are switched automatically by the press-to-talk switch of the handset. Other switching sections indicate the switching positions of the SYSTEM switch.

TRANSMITTER

Voice signals from the mike unit of the handset are fed through the amplifier to the 1st ring modulator (To simplify the explanations, assume that the voice signal is 1500 c/s single tone). At the same time, the 453.5 Kc local carrier from the first oscillator is also applied to the 1st ring modulator. As a result, both upper and lower side bands with suppressed carriers are made available on the output side (455 Kc and 452 Kc). A SSB filter with a center frequency of 455 Kc and pass band width of 2.4 Kc is provided to make only the upper side band available from them. Since this filter gives a very large attenuation to the signals outside the band, perfect SSB signals can be obtained here. The input and output sides of the SSB filter are respectively provided with an IF amplifier circuit which serves as a buffer. The 455 Kc SSB signals are fed to the 2nd ring modulator for further conversion into a channel frequency.

The local carrier is produced by six crystal oscillator units, and its frequency is set at a channel frequency minus 455 Kc. The output of the 2nd ring modulator is fed to the next RF amplifier and is selected by the channel frequency tuned circuit. It is further passed through the intermediate power amplifier (IPA) and is fed to the power amplifier. When the rod antenna is in use, it is supplied through the loading coil to the antenna.

When the dipole antenna is in use, on the other hand, the 3W transmitting output is supplied directly from the 75-ohm output terminal (AUX-ANT). For communications with an DSB radio set (A3), SSB radio waves with the carrier must be transmitted. For this purpose, part of the first oscillator is supplied to circuits following the SSB filter.

The tone oscillator makes 1500 c/s AF signals available. For the best possible transmission, use the Morse key communication in which case the 1st buffer circuit is keyed for sending CW morse signals.

To tune the antenna, the tone oscillator can take the place of voice signals to modulate the transmitter.

RECEIVER

Received signals are applied from the antenna to the RF amplifier. This circuit is switched from the transmitter IPA when used. The amplified signals are fed to the mixer where they are mixed with the local oscillator output from the 2nd local oscillator for conversion into 455 Kc IF signals. Thereafter, they are passed through the same path of the SSB filters as in the case of transmission. They are then passed through the two-stage IF amplifier for demodulation, and through the two-stages of AF amplifier circuit for application to the earphone unit of the handset. When A3 signals are received, they are not passed through the SSB filter but are switched to the DSB receiving unit. The AGC circuit rectifies the AF output and supplies the AGC voltage to the RF amplifier through the time constant circuit.

POWER UNIT

The power unit consists of a 6V nickel cadmium alkali battery and a transistor DC-DC converter. The transistor DC-DC converter operates only during transmission and supplies power to the collector of the PA transistor.

The power unit is provided with a connector, which makes it possible to operate the TRP-4A from a 6V external DC power source. Therefore, communications can be made with the power supply of vehicles. In addition, the hand generator can be used.

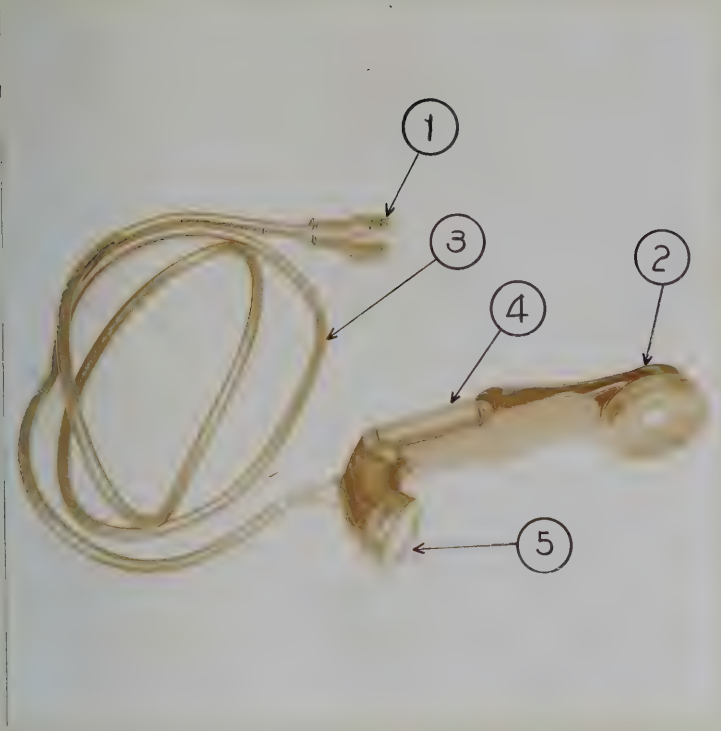
ACCESSORIES LIST

CLASSIFICATION	REQUIREMENTS	NOMENCLATURE
STANDARD	For minimum level operation (short range (up to 20 Km) communication only)	Carrying bag for radio set
		Handset JH-33/PT
		Rod antenna with base and flexible mounting
OPTIONAL	For middle and long range (20 - 300 Km) communication	Extension section of rod antenna
		Half-wave dipole antenna
		Shoulder bag for Accessories
	For CW communi-cation	Morse Key JJ-37
		Headset (Applicable for monitoring of radio telephone communication
	For exclusive charging of TRP-4A battery	Battery charger TRX-146 (set for one of 100, 110, 200 or 220 volts AC)

CLASSIFICATION	REQUIREMENTS	NOMENCLATURE
	For communication when battery ran down	Hand generator
		Bag for hand generater
	For a long hour continuous communication	Spare battery
In addition to the accessories itemized above, optional dry battery, linear amplifier for fixed station use, shockmount and antenna matching box for vehicle mounting use, etc. are available upon customer's special request.		

CARRYING BAG

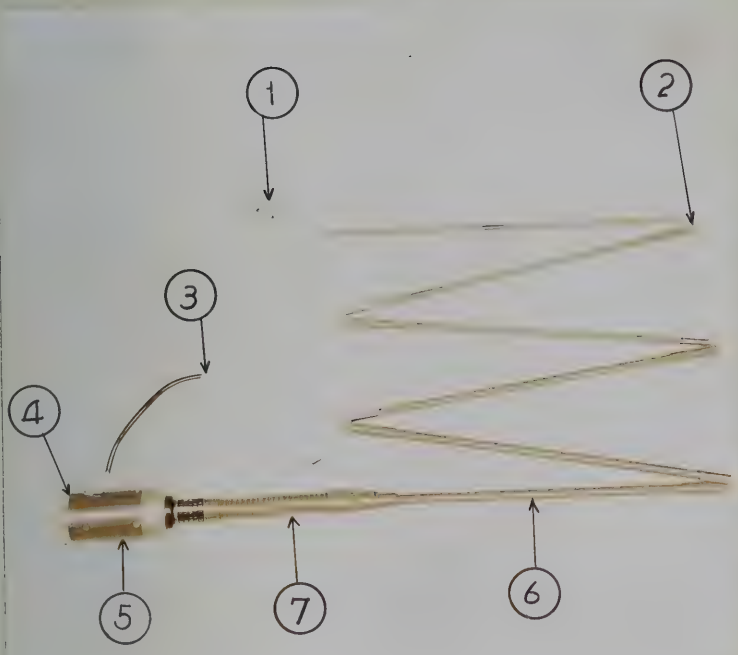
HANDSET JH - 33/PT



Bayonet connector ------- (1)
Receiver ------------- (2)
Cord ---------------- (3)
Press-to-talk switch ----- (4)
Transmitter ------ (5)

This handset is of water-proof construction, provided with a press-to-talk switch. For press-to-talk communications, connect this to the 10-pole handset connector on the front panel of the TRP-4A.

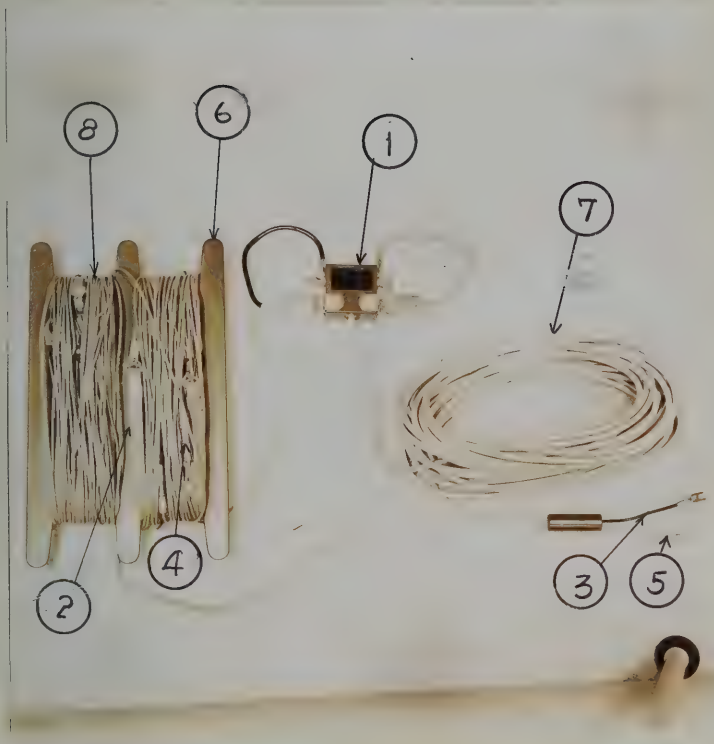
ROD ANTENNA



Wire stop ---------- 1
Core wire ---------- 2
Connect to E terminal ---------- 3
Connect to ROD ANT. terminal ---------- 4
Antenna base ---------- 5
Antenna section ---------- 6
Flexible coupling ---------- 7

This antenna is used for mobile communications over relatively short distances. It is designed to provide optimum performance in jungles and other difficult conditions. Made of chrome molybdenum, it consists of six separable antenna sections, a flexible coupling and an antenna base. Connect it to the ROD ANT terminal of the front panel of the TRP-4A. The distance of communications for which the use of this antenna is suitable is 20 Km or thereabouts, although it varies with the frequency bands, surrounding conditions, etc.

HALF WAVELENGTH DIPOLE ANTENNA



Center connector ---------- (1)

Nylonrope to stretch dipole antenna -------- (2)

Connect to E terminal (black) ------- (3)

Connector ---------- (4)

Connect to AUX ANT terminal (red) --------- (5)

Winding frame for antenna element ---------- (6)

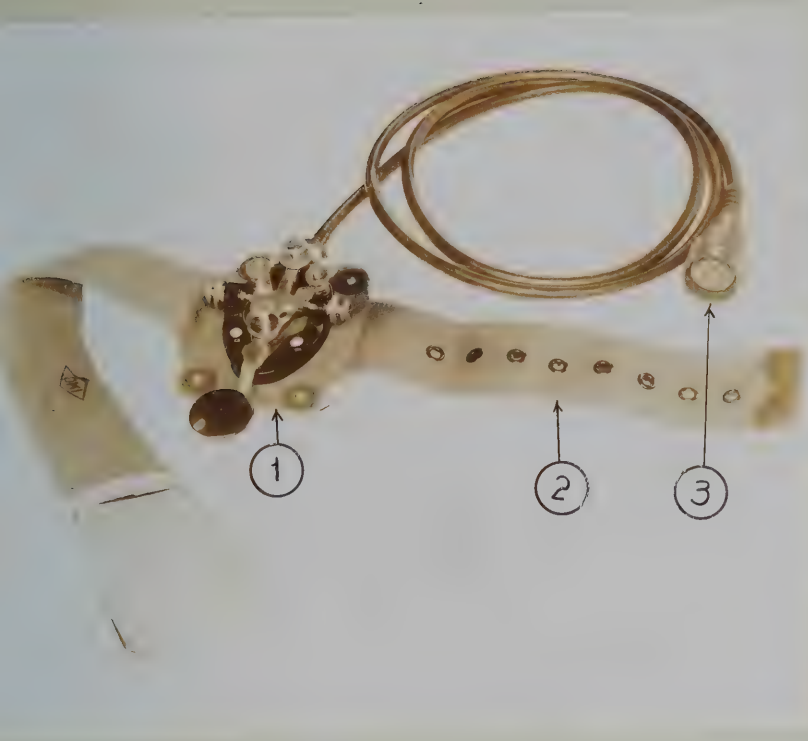
Feeder, 10m ---------- (7)

Antenna element ---------- (8)

This antenna is a half wavelength horizontal dipole antenna used for point-to-point communications over relatively long distances. It consists of antenna elements, a center connector, a 75-ohm feeder and a winding frame. Connect this antenna across the AUX ANT and E terminals of the front panel of the TRP-4A. The antenna is divided into five sections for 3, 4, 5, 6 and 7 Mc bands, and is so designed that the switchover from one section to another can be done with the plug and jack. Depending on the channel frequency band, therefore, the element lengths can be accurately selected.

The total length of the feeder is approximately 10m. Although this antenna usually requires two antenna poles, they can be substituted for by trees or buildings in the field or in the woods. Furthermore, the operation of the antenna with one side of the horizontal elements used vertically or inclined and the other side counter-poised can constitute an all-direction antenna. Used as a horizontal dipole antenna, it allows communications over hundred kilometers.

MORSE KEY JJ-37



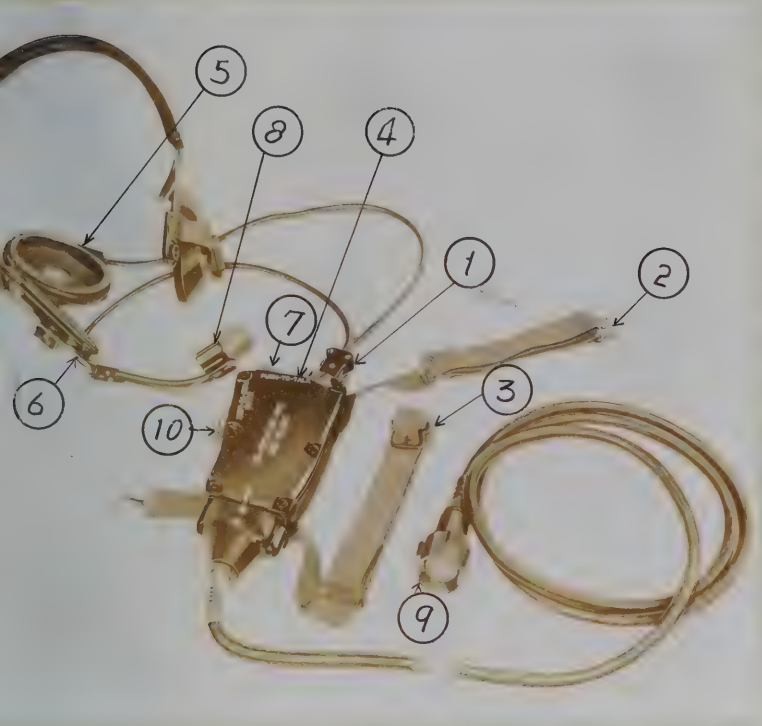
Morse key ---------- (1)

Belt, fastened to thigh of the operator ---- (2)

Connector ---------- (3)

This is the Morse key used when the TRP-4A is used for A1 communications. To operate the key, the attached belt is usually tightened to the thigh. Connect it to the handset connector of the front panel of the TRP-4A through the use of a 10-pole connector.

HEADSET



Headset plug ---------- (1)

Shoulder belt ---------- (2)

Waist belt ---------- (3)

Switch box ---------- (4)

Earphone ---------- (5)

Fit transmitter to headband clasp ---------- (6)

Press-to-talk switch ---------- (7)

Microphone ---------- (8)

Connector ---------- (9)

Turn to-lock switch (for continuous transmission) ---------- (10)

This headset is particularly convenient for hand free operation. It consists of a two-piece earphone, a press-to-talk switch box worn on the breast, mike unit and cord. Its electrical performance is the same as that of the JH-33/PT handset.

TRX-146 CHARGER

Composed of the charger proper, an AC input cord, a DC output cord and leads for parallel connection, the TRX-146 can charge two sets of 6V nickel cadmium alkali battery in parallel. These cords are accommodated beneath the bottom of the charger proper. The AC power supply applied to this charger is a single phase 50/60 c/s, 100, 110, 120V/200, 220 or 240V, either one of which is factory set according to the customer's specifications.

HAND GENERATOR

When the TRP-4A is used in areas where there is no power supply, the hand generator is used for communications while charging the battery. Connect it to the external power supply connector provided on the side of the power unit of the TRP-4A with a 3-pole connector.

SPECIFICATIONS:

1. GENERAL:

Number of channel	6 crystal pre-tuned
Frequency range	2.5 to 7.8 Mc
Type of emission	A3J -- SSB Supressed Carrier
	A3H -- SSB with Carrier
	A3 -- DSB (receiving only)
	A1 -- CW (SSB Keyed Tone)
Suitable antenna	Rod Antenna
	Dipole Antenna
Ambient temperature	-15° to +55°C
Dimensions	140 mm (5-3/5") ~~high~~ deep
	270 mm (10-7/10") wide
	380 m/m (15") ~~deep~~ high
Weight	10 kgs. (22 lbs) approx.

2. TRANSMITTER:

Power	A3H 1 watt
	A3J 3 watts (PEP)
	A1 3 watts
Frequency stability	Within 50 c/s for channel frequency of 4 Mc or lower
	Within 90 c/s for channel frequency of 4 Mc or higher
Transmitted sideband	Upper sideband (Lower sideband is available upon request)
Spurious radiation	-40 dB or less
Type of operation	Simplex press-to-talk telephony
	Keyed tone telegraphy
Carrier suppression	-30 dB or better

3. RECEIVER:

Receiving system	Superheterodyne	
Sensitivity	A3J:	Better than 1 micro-volt, for 5 ~~10~~ mW audio output with 10 dB signal to noise ratio
	A3:	Better than 10 micro-volts for 10mW audio output with 20dB signal to noise ratio
Image ratio	Better than 40 dB	
Selectivity	A3J:	2.4 Kc bandwidth for 6dB attenuation 5 Kc bandwidth for 60dB attenuation
	A3:	4.0 Kc bandwidth for 6dB attenuation 20.0 Kc bandwith for 20dB attenuation

4. POWER SUPPLY:

Battery	6 volts (1.2 volts x 5)	
DC-DC converter	Input:	6 volts d.c.
	Output:	+24 volts d.c. -- 30 ~~170~~ mA -35 ~~-55~~ volts d.c. -- 170 mA
Power consumption	Transmission:	10 watts (approx.)
	Reception:	0.07 watts (approx.)

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